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EXAMINER	
DUONG, KHANH B	

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 09/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/634,867	KONG ET AL.	
	Examiner	Art Unit	
	Khanh B. Duong	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 June 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-7,13,16-22,24-33 and 42-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-7,13,16-22,24-33,42,43 and 45-48* is/are rejected.

7)☒ Claim(s) *44* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Response to Amendment

Accordingly, claims 1, 4, 13, 19 and 42 were amended, and new claims 43-48 were added

Currently, claims 1, 4-7, 13, 16-22, 24-33 and 42-48 are pending in the application.

Response to Arguments

Applicant's arguments with respect to the amended claims have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

Claim 13 is objected to because of the following informalities: line 12, after "through", "insulating the layer" should be --the insulating layer--. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 19-22 and 24-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 19 recites the limitation "the silicon nitride layer" (2 occurrences) in lines 10 and 14. There is insufficient antecedent basis for this limitation in the claim.

*** Other claims are rejected as depending on the rejected base claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 1, 6, 7 and 45 are rejected under 35 U.S.C. 102(e) as being anticipated by Kaneko et al. (US 6,433,842).

Re claim 1, Kaneko et al. ("Kaneko") discloses in FIG. 1 a method for manufacturing a wire contact structure, comprising steps of: forming a first conductive layer 8 formed of an aluminum or aluminum alloy material; depositing an insulating layer 10 (comprised of silicon nitride); forming a contact hole 19 extending through the insulating layer 10 and exposing the aluminum or aluminum alloy material of the first conductive layer 8; and forming a second conductive layer 11 formed of indium zinc oxide (IZO) and not directly contacting the aluminum or aluminum alloy material of the first conductive layer 8 through the contact hole 19 [see col. 7, line 1 to col. 8, line 65]. By forming the IZO layer 11 and the aluminum or aluminum alloy

material layer 8 not directly contacting each other, Kaneko has overcome the known problems associated with high contact resistance that occur when such layers were formed directly contacting each other [see col. 1, lines 30-35]. Thus, Kaneko expressly discloses that IZO (or ITO) has been known to form directly contacting with aluminum or aluminum alloy material in order to exhibit such high contact resistance. Therefore, it is understood that Kaneko discloses a first embodiment that shows an indium zinc oxide (IZO) not directly contacting aluminum or aluminum alloy material layer, and a second embodiment that shows an indium zinc oxide (IZO) directly contacting aluminum or aluminum alloy material layer.

Re claims 6 and 7, since the contact structure of the first conductive layer 8 of Kaneko are formed of the same materials (aluminum) as the claimed invention, it must be inherent that a contact resistance between the first conductive layer 8 and the second conductive layer 11 is less than 10% of a resistance of the first conductive layer or less than 0.15 $\mu\Omega cm^2$.

Re claim 45, see discussion above regarding claim 1.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaneko.

Re claims 4 and 5, Kaneko fails to disclose process parameters in regard to deposition time and contact hole size.

However, It would have been obvious to a person of ordinary skill in the art at the time the invention was made to optimize and select an appropriate deposition time and contact hole size. The selection of parameters such as energy, power, concentration, temperature, time, depth, thickness, etc., would have been obvious and involve routine optimization which has been held to be within the level of ordinary skill in the art. "Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce new and unexpected result which is different in kind and not merely degree from results of prior art ... such ranges are termed 'critical ranges' and the applicant has the burden of proving such criticality ... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In re Aller*, 105 USPQ 233, 235 (CCPA 1955). See also MPEP 2144.05.

Claims 42 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaneko in view of Fogarty et al. (US 4,181,564).

Kaneko discloses a method for manufacturing a wire contact structure previously as described, which method is repeated herein. Kaneko further discloses in FIG. 1 the following steps: depositing a first conductive layer (8 and 9) formed of aluminum (portion 8) on a substrate

1; inherently patterning the first conductive layer (8 and 9) to form a "signal line"; depositing a silicon nitride layer 10 on the "signal line" at a fixed temperature of 230°C; forming a contact hole 19 extending through the silicon nitride layer 19 and exposing the "signal line"; forming a second conductive layer 11 formed of indium zinc oxide (IZO) and directly contacting the "signal line" through the contact hole 19.

Re claims 42 and 46, Kaneko discloses depositing the silicon nitride insulating layer 10 at a temperature of 230°C instead of between about 280°C and about 400°C for about 5 minutes to about 40 minutes.

Fogarty et al. ("Fogarty") suggests forming a silicon nitride layer at a temperature between 270°C and 375°C and for a period of about 45 minutes [see col. 2, line 65 to col. 3, line 3 and col. 4, lines 35-55].

Since Kaneko and Fogarty are both from the same field of endeavor, the purpose disclosed by Fogarty would have been recognized in the pertinent prior art of Kaneko.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Kaneko as suggested by Fogarty, since Fogarty states at column 4, lines 26-29 such modification would provide a silicon nitride layer having an essentially constant Si/N ratio throughout the thickness of the layer.

Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kaneko in view of Voutsas et al. (US 5,994,156).

Re claim 43, Kaneko fails to disclose preheating the first conductive layer before forming the second conductive layer.

Voutsas et al. ("Voutsas") suggests in Fig. 5 preheating a first conductive layer 50 (comprised of aluminum) before forming a second conductive layer in order to reduce hillock formation on the first conductive layer 50 [see col. 7, line 12 to col. 8, line 14].

Since Kaneko and Voutsas are from the same field of endeavor, the purpose disclosed by Voutsas would have been recognized in the pertinent prior art of Kaneko.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the method disclosed by Kaneko as suggested by Voutsas because of the desirability to minimize hillock formation on the first conductive layer.

Claims 13, 18 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Song et al. (US 6,163,356) in view of Kaneko.

Song et al. ("Song") discloses in FIG. 4a to 4f a method for manufacturing a thin film transistor array panel, comprising steps of: depositing a first conductive layer formed of an aluminum-based material on a substrate 1; patterning the first conductive layer to form a low-resistance gate line 13a and a low-resistance gate pad 15a connected to the low-resistance gate line 13a; depositing an insulating layer 17 on the low-resistance gate line 13a and the low-resistance gate pad 15a; forming a semiconductor layer (33, 35) on the insulating layer 17; depositing a second conductive layer (21 and 31) on the semiconductor layer (33, 35); patterning the second conductive layer (21 and 31) to form a "data line"; forming a contact hole 59 extending through the insulating layer 17 and exposing the material of a gate pad 15 (formed on the aluminum-based material of the low-resistance gate pad 15a); depositing a third conductive layer formed of an ITO layer; and patterning the third conductive layer to form a conductive

pattern 57 directly contacting the material of the gate pad 15 in the contact hole 59 [see col. 4, line 30 to col. 5, line 67].

Re claim 13, Song discloses the ITO layer 57 is formed directly contacting the material (Cr, Mo, Ta or Sb) of the gate pad 15, instead of the aluminum-based material of the low-resistance gate pad 15a. Song further discloses using ITO, instead of indium zinc oxide (IZO), to form the conductive pattern directly contacting the gate pad.

Kaneko, as previously discussed above in regard to claim 1, expressly discloses a first embodiment that shows an ITO or IZO not directly contacting aluminum or aluminum alloy material layer, and a second embodiment that shows an ITO or IZO directly contacting aluminum or aluminum alloy material layer. The purpose for the former would have been to form a low resistance gate line, and the purpose of the latter would have been to form a high resistance gate line.

Since Song and Kaneko are from the same field of endeavor, the purpose disclosed by Kaneko would have been recognized in the pertinent prior art of Song.

Therefore, it would have been obvious to one of ordinary skill in the art to modify the process of Song by forming an ITO or IZO layer not directly contacting the aluminum or aluminum alloy material layer for the purpose of forming a high resistance gate line. Furthermore, because ITO and IZO were art-recognized equivalent materials as demonstrated by Kaneko at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute one material for the other.

Re claim 18, Song expressly discloses in Fig. 4f the step of patterning the third conductive layer comprises a step of forming a pixel electrode 41 connected to the "data line" 31.

Re claim 47, Song discloses in Fig. 4c the insulating layer 17 comprises of silicon oxide or silicon nitride [see col. 4, lines 51-53].

Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Song and Kaneko as applied to claims 13, 18 and 47 above, and further in view of Arai et al. (US 6,399,222).

Re claims 16 and 17, Song and Kaneko do not specifically mention the third conductive layer (IZO) being formed by sputtering target including In_2O_3 and ZnO, wherein the content of Zn in a compound of In_2O_3 and ZnO is in the range of 15-20%.

Arai et al. ("Arai") suggests the indium zinc oxide is preferably formed by sputtering target including In_2O_3 and ZnO, wherein the content of Zn in a compound of In_2O_3 and ZnO is in the range of 1-20% [see col. 4, lines 22-32].

Since Song, Kaneko and Arai are from the same field of endeavor, the purpose disclosed by Arai would have been recognized in the pertinent prior art of Song and Kaneko.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined process of Song and Kaneko as suggested by Arai, since Arai states at column 4, lines 47-49 that such modification would provide an electrode layer having a sufficient thickness.

Furthermore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to optimize and select an appropriate content of Zn in a compound

of In_2O_3 and ZnO within the range as taught by Arai. The selection of parameters such as energy, power, concentration, temperature, time, depth, thickness, etc., would have been obvious and involve routine optimization which has been held to be within the level of ordinary skill in the art. "Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce new and unexpected result which is different in kind and not merely degree from results of prior art ... such ranges are termed 'critical ranges' and the applicant has the burden of proving such criticality ... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In re Aller*, 105 USPQ 233, 235 (CCPA 1955). See also MPEP 2144.05.

Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Song and Kaneko as applied to claims 13, 18 and 47 above, and further in view of Fogarty.

Re claim 48, Song and Kaneko do not disclose depositing the silicon nitride insulating layer at a temperature between about 280°C and about 400°C.

Fogarty et al. ("Fogarty") suggests forming a silicon nitride layer at a temperature between 270°C and 375°C and for a period of about 45 minutes [see col. 2, line 65 to col. 3, line 3 and col. 4, lines 35-55].

Since Song, Kaneko and Fogarty are both from the same field of endeavor, the purpose disclosed by Fogarty would have been recognized in the pertinent prior art of Song and Kaneko.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined process of Song and Kaneko as suggested by Fogarty, since

Fogarty states at column 4, lines 26-29 such modification would provide a silicon nitride layer having an essentially constant Si/N ratio throughout the thickness of the layer.

Allowable Subject Matter

Claims 19-22 and 24-33 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

Claim 44 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ahn (US 6,444,484) and Tanaka (US 4,960,719) teach forming an ITO layer directly contacting a gate line comprising aluminum [see Ahn's FIG. 4D and Tanaka's FIG. 4].

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh B. Duong whose telephone number is (571) 272-1836. The examiner can normally be reached on 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KBD

Zandra V. Smith
Supervisory Patent Examiner
18 Sept. 2008